MARYLAND'S NONPOINT SOURCE PROGRAM
FFY 2005 Section 319(h) Incremental Proposal

Incremental Project 4

Project Title: **Corsica River Restoration Project**
- **§ Monitoring for Interim and Post Project Water Quality**
  - **o Cover crop implementation results**
  - **o Stormwater bmp implementation results**
- **§ Monitoring for Living Resource Projections**

Proposed Budget:

Federal §319:	**$208,040**
Non-Federal Match:	$138,693
Total:	$346,733

Project Funding Period: October 01, 2005 - September 31, 2006

Expected Duration: October 01, 2005 – September 31, 2008

Project Area: Corsica River Watershed
Priority Category 1, 02130507
WRAS Developed
TMDL Approved – Nitrogen & Phosphorus
303(d) List: Bacteria (1996), Biological (2004 draft, 2002), Sediments (1996), Toxics (2002)

Sponsoring Agency: Maryland Department of Natural Resources
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Federal Tax ID Number: 52-600-20-33

Date Submitted: June 30, 2005

PROPOSAL SUMMARY

In Maryland, a comprehensive monitoring project is being conducted to assess early progress in the Corsica River Watershed Restoration Project and to provide feedback necessary to enhance the success of future watershed restoration projects. The evaluation information from the Corsica River Watershed Restoration Project will be adaptively applied to manage future watersheds. Implementation tracking, project assessments, and monitoring data will provide feedback. This will include an approach to capturing full costs related to the project and ensure accurate estimates of future costs for successive watershed implementation projects. The evaluation will determine the progress this project is making towards implementation goals by tracking implementation and funding acquisition and expenditures.

Progress towards meeting water quality criteria will be determined using water quality data, SAV coverage and survival data, and oyster survival and population estimates. Progress towards correcting biological impairments in the fresh water tributaries will be determined by changes in biological indices.

As a subset of the above initiative, the following effort is proposed for 319(h) support.

- To provide an ongoing systematic assessment of changes in nitrate leaching rates and nitrate concentrations in shallow groundwater relative to cover crop best management practices implemented throughout the Corsica River watershed so that early progress toward meeting nitrogen loading reduction goals may be assessed.
- To assess nutrient loads in stormwater runoff from newly constructed high-density subdivisions in the Corsica River watershed so that the Town of Centreville can adaptively manage, through code changes or other approaches, stormwater management.
- To conduct sampling in order to evaluate anadromous fish spawning and nursery habitat in the Corsica River.

Nitrate Concentrations in Ground Water from Agricultural Fields

Agriculture is a major land use in the Corsica River watershed, and studies conducted in the adjoining Jarmin Branch watershed as well as in the Choptank, found subsurface transport of nitrate to be the dominant component of nitrogen loss from cropland and total watershed nitrogen discharge (Staver et al. 1996; Primrose et al. 1997). Preliminary monitoring of tributaries of the Corsica River indicates elevated stream base flow nitrate concentrations, as would be expected given the intensity of agricultural activities in the watershed. Another finding from the Jarmin Branch studies, as well as from other studies in the region (Staver and Brinsfield 1991; Dunkle et al. 1993; Staver 2000), is that residence times for water in shallow aquifers in the Coastal Plain often exceed five years. Since management practices that reduce subsurface nitrate transport work by reducing the rate of nitrate leaching from the root zone, their eventual effect on nitrate discharge into surface waters may not be fully evident for many years. Even in crop field located directly adjacent to tidal waters, several years are required for changes in root zone nitrate leaching rates to fully affect nitrate discharge rates into surface waters (Staver and Brinsfield 2000). As a result, stream flow monitoring can be expected to provide little information

regarding progress toward meeting nonpoint source nitrogen reduction goals in the first few years after targeted implementation begins.

For assessing early progress toward reducing subsurface nitrate loads, sampling must be conducted close to the point of entry into the subsurface flow system. Even shallow groundwater monitoring often fails to reveal changes in nitrate leaching rates for several years. In long-term studies of the effectiveness of cover crops on subsurface nitrate transport in field-scale watersheds in the Wye River drainage basin, more than 5 years were required for groundwater nitrate concentrations to fully reflect the 60-70 percent reduction achieved in nitrate leaching rates (Staver and Brinsfield 1998). In the Jarmin Branch studies, residence time in the intermediate vadose zone (between the bottom of the root zone and the water table) averaged more than a year and was over three years at higher elevations. Since little information on the characteristics of the subsurface flow system in the Corsica River watershed has been collected, it is not possible to know a priori exactly how long it will take for field management practices to reduce subsurface nitrate loads to the river. However, studies conducted within the region suggest that soil coring is the only option available for verifying progress toward reducing rates of nonpoint source nitrogen delivery to the Corsica River during the first few years of the targeted implementation effort, with edge of field groundwater monitoring providing information on progress during somewhat longer time frames.

Methods

The primary field activity in this project will be the collection of soil cores from cropland throughout the Corsica River watershed. This effort will build on results from an ongoing study that is evaluating baseline subsurface nitrate concentrations under cropland prior to the start of the targeted implementation effort. Sample sites will be chosen with assistance from the Queen Anne's County Maryland Cooperative Extension and USDA Natural Resource Conservation Service personnel. Sites will be chosen so as to fully cover the spatial extent of the watershed as well as the varying soil and hydrogeologic settings and cropping patterns. Sites will be chosen where winter cover crops have been used to evaluate how this practice has reduced nitrate leaching rates. Additional sites where cover crops are not used also will be sampled to provide a spatial comparison in addition to the comparison with baseline conditions. Winter cover crops are the primary practice being implemented to reduce nitrate leaching rates.

At each sampling site 5 cm diameter cores will be collected from the soil surface to approximately 0.5 m below the water table in 15 cm increments. Three cores will be collected in each field and GPS coordinates will be established for each sampling site. The depth of sampling will depend on the depth of the water table at the site. It is anticipated that approximately 100 cores will be collected from 30 to 40 fields each year. Again, the exact number of samples collected cannot be projected since precipitation patterns will affect water table position, which, in turn, affects the number of samples. A total of 1500-2000 individual samples is anticipated. Samples will be placed in sealed containers in coolers in the field and then transported to the Wye Research and Education Center where samples will be weighed and placed in drying ovens at 40 degrees C. After drying, samples will be reweighed to determine water content, then ground and extracted using 1 M KCl. Extracts will be analyzed colorimetrically to determine nitrate content.

Analysis results will be entered in spreadsheets and used to calculate profile water content, pore-water nitrate concentrations, and total nitrate and water storage. The water data will be useful for estimating vadose zone residence times. Sampling will be carried out primarily during fall, winter and spring until crop planting limits field access. A limited number of samples also will be collected in late June and early July following barley and wheat harvest.

In addition to soil coring, edge-of-field well nests will be established at four sites in the watershed to track changes in groundwater nitrate concentrations leaving crop fields. These nests will be placed adjacent to fields where implementation of cover crops is anticipated. These nests will provide information in an intermediate time frame regarding changes in nitrate leaching rates, and also will give an indication of subsurface nitrate loading rates to riparian areas. Information from these well nests will establish baseline edge-of-field groundwater nitrate concentrations and also will be useful in future years for tracking the effects of efforts to reduce nitrate leaching rates. The depth of these wells will depend on site-specific hydrogeology but the objective will be to sample the primary strata transmitting groundwater from the crop field to the local surface water, which could be a stream or tidal waters of the Corsica. These wells will be sampled at a minimum quarterly. Wells will be sampled using standard techniques and all samples will be analyzed for nitrate, sulfate, and chloride in the laboratory at the Wye Research and Education Center. A final report summarizing all findings will be submitted 3 months following the data collections period.

Development contribution to the Nonpoint Source Load

Most of the effort to reduce nonpoint source nutrient inputs to Chesapeake Bay on the Eastern Shore has focused on agriculture, which is the dominant land use. However, residential growth rates in Queen Anne's County and throughout the Eastern Shore have increased dramatically in the last few years and these rates of growth are expected to continue in the near future. Relatively little information is available on how converting cropland to residential areas will affect nonpoint source nutrient loads. Residential growth also has increased in the Corsica River watershed and several major developments are currently being built on the outskirts of Centreville, directly adjacent to the tidal headwaters of the Corsica. These new developments are in designated growth areas and have high levels of impervious surface, but are built to meet current stormwater control regulations. Current stormwater control design standards are aimed at controlling peak flows, but their effects on nutrient losses have not been well characterized. With the ongoing and projected high rates of growth throughout the Eastern Shore, it is likely that residential areas will play an increasing role in determining nonpoint source nutrient loads to Eastern Shore tributaries. Characterizing the nutrient loads from this new development is essential for projecting the effect of growth on water quality in the Corsica and Chesapeake Bay, and also will give an indication whether current stormwater control regulations are adequate for meeting water quality restoration goals. Characterizing nutrient discharge patterns also will be useful for identifying activities in the drainage basin that are contributing to nutrient loads. This information will be useful for designing homeowner education programs that help reduce nutrient losses in stormwater. Results should be applicable to the many other newly developed areas on the Eastern Shore and also could be useful for developing approaches for reducing stormwater nutrient loads from older residential areas.

Methods

The primary field activity in this project will be continuous monitoring of flow and chemical characteristics of stormwater discharged from stormwater detention basins in a newly constructed subdivision in the town of Centreville. Discharge from this site is into the tidal headwaters of the Corsica. Stormwater will be monitored using flow triggered automated samplers located at the outlet structure of the stormwater detention basin. Discrete samples will be collected from each storm event based on flow volume. Samples will be retrieved at the end of each event and transported to the Wye Research and Education Center for analysis. Each sample will be analyzed for pH, total suspended sediments, nitrate, phosphate, ammonia, and total and dissolved total nitrogen and phosphorus. Although precipitation patterns during the monitoring period will determine the number of events and total discharge, it is anticipated that approximately 200-300 samples will be collected during a 12-month monitoring period. Total nutrient loads will be determined for each event and annually. Precipitation also will be monitored at the site to assess the percentage of precipitation discharged from the site and the contribution of nutrients in precipitation to nutrient discharge from the site. Level in the detention basin also will be monitored continuously to determine storage capacity available at the beginning of each event. Pan evaporation rates are measured continuously at the Wye Research and Education Center and will be used to determine the extent of seepage losses from the detention basin. The area of the drainage basin for the site will be determined so that total impervious area can be assessed on a percentage basis and also so that nutrient loads can be expressed on per unit and per dwelling basis.

In addition to the continuous monitoring of storm events, seasonal assessments of local stream flow characteristics will be conducted to determine the effects of storm flow discharge on the stream environment. In addition to nutrient parameters described above, temperature, pH, and dissolved oxygen levels will be monitored continuously in the stream environment adjacent to the detention basin outlet for a one week period each season. The monitoring period will be lengthened if necessary to include at least one storm event. A final report of results from the one-year monitoring period will be submitted 3 months after completion of the collection.

Anadromous fish, including striped bass, American shad, hickory shad, alewife herring, blueback herring, white perch and yellow perch, have historically supported economically important commercial and recreational fisheries in the Bay. These species live in estuarine or marine systems as adults and migrate into the tidal fresh and freshwater reaches of the Bay to spawn. Larval and juvenile life stages feed and grow in the confined tidal freshwater areas of the Bay's headwater and tributaries. While these species are generally wide-ranging, their early life stage and adult habitats may be confined to small areas vulnerable to landscape-related pressures (high nutrients, contaminants, disrupted hydrology). In the Bay, impaired habitat has been identified as a major threat to anadromous species, particularly yellow perch (Uphoff, et al. 2005), alewife and blueback herring (Klauda et a. 1991).

Habitat requirements for spawning and larval habitat for alewife and blueback herring and yellow perch have been described (Funderburk et al. 1991). Historical assessments of spawning and larval habitat indicate that yellow perch, white perch, alewife and blueback herring utilized

the Corsica River for spawning and larval habitat (O'Dell et al. 1980). However, the watershed is under urbanization pressure, which has been shown to threaten anadromous fish habitat (Limburg and Schmidt 1990; Uphoff et al. 2005). Urbanization contributes significantly to contaminant loads, eutrophication, and physical degradation of coastal areas (Pearce 1991; Beach 2002). Research in freshwater streams has revealed a strong relationship between impervious cover and degradation of stream quality (Capiella and Brown 2001). As little as 10% watershed impervious cover can result in degraded stream conditions such as altered hydrology, elevated temperatures, eutrophication, and increased contaminants (Capiella and Brown 2001). Limburg and Schmidt (1990) noted a negative relationship and a significant threshold for declining anadromous fish spawning success in Hudson River, New York, watersheds in response to urbanization. Habitat degradation in the best recruitment areas of the Baltic Sea due to human activities (agriculture, forestry, industry, and settlement) has been implicated in the decline of estuarine populations of European perch *Perca fluviatilis* (Ljunggren et al. 2003).

Two significant habitat quality issues related to urbanization that potentially impacted yellow perch population dynamics were described in a recent study of Severn River –salinity intrusion into the upper tidal spawning area and larval nurseries due to landscape changes, and poor summer dissolved oxygen throughout juvenile and adult habitat (Uphoff et al. 2005). Depressed egg and larval viability appear to be critical factors suppressing Severn River yellow perch. PCB levels in white perch fillets in 14 tributaries were closely related to impervious surface in the watershed (King et al. 2004). Anthropogenic chemicals such PCBs disrupt endocrine function associated with reproduction and are associated with depressed survival, malformation, and abnormal chromosome division of eggs and larvae (Longwell et al. 1992; Longwell et al 1996; Colborn and Thayer 2000; Rudolph et al. 2003).

A TMDL for nutrients has been developed for the Corsica River, and stream restoration efforts to achieve needed nutrient reductions are in the planning stage. The three major tributaries to the Corsica River are also listed as biologically impaired. The restoration efforts need to consider anadromous and resident fish habitat needs in addition to nutrient reduction in order to realize the full benefit of habitat restoration.

Methods

Year 1:
We will conduct sampling for early life stages of anadromous fish and compare our results to historical data collected in the 1970s. We will conduct ichthyoplankton tows in tidal areas and use stream drift nets in nontidal waters (by employing a combination of volunteer and paid staff) to reproduce anadromous spawning surveys conducted by O'Dell et al (1980). We will sample juveniles in the summer as part of our existing Impervious Surface Project. These data will be used to delineate spawning (by presence of eggs) and larval habitat (by presence of larvae) in Corsica River. These data will be compared to historical data to define the change in habitat use, and determine which species continue to spawn in the Corsica River. These results will be used to guide sampling in Year 2.

Year 2:

Based on comparisons to historical information, we will conduct additional sampling (fyke or drift net sampling) to assess adult populations if we deem necessary. In cases where historical spawning sites are no longer supporting spawning, we will assess physical and chemical habitat parameters that have been defined (Funderburk et al. 1991) to determine what factors are contributing to the habitat decline. These data will be useful in guiding stream restoration in order to achieve the benefits of nutrient reduction and fish habitat restoration.

GOALS AND OBJECTIVES

A. Nitrate Concentrations in Ground Water: The project will provide an ongoing systematic assessment of changes in nitrate leaching rates and nitrate concentrations in shallow groundwater throughout the Corsica River watershed to assess progress toward meeting nitrogen loading reduction goals.

Objective 1. Collect soil cores from cropland sites throughout the Corsica watershed to demonstrate early the effects of cover crops on nitrate concentrations in the root zone.

Measurable Environmental Results

1. Changes in nitrate concentrations relative to previously collected core samples (NOAA).
2. Changes in nitrate concentrations relative to cores under similar fields with no cover crops.
3. Changes in nitrate concentration relative to cover crops.

Interim Measures

1. Approximately 100 cores from 30 to 40 fields drilled.
2. Approximately 1500 to 2000 samples collected from cores.
3. Intermediate water profiles would include pore water nitrate content, total nitrate water content and estimations of vadose residence times.

Objective 1. Demonstrate the intermediate effect of cover crops on nitrate leaching rates and subsurface nitrate loading rates to riparian areas in shallow ground water using shallow wells at edge of field tests at four sites.

Measurable Environmental Results

1. Established baseline edge-of-field groundwater nitrate concentrations.
2. Results for nitrate, sulfate, and chloride.

Interim Measures

1. Four wells drilled (estimated).
2. Quarterly samples collected from wells (estimated).

B. Development contribution to the Nonpoint Source Load Goal: Measure the contribution of new development to the non point source load in the Corsica River.

Objective 1. Continuously monitor flow from development with stormwater BMPs to provide information for the proposed stormwater management ordinance by the Town of Centerville.

Measurable Environmental Results

1. Flow, pH, total suspended sediments, nitrate, phosphate, ammonia, and total and dissolved nitrogen and phosphorus data reflecting loads from standard BMP approaches in new developments.

Interim Measures

2. Flow triggered automated samplers installed.
3. Samples from each storm event collected and analyzed, (estimated 200 to 300 samples collected during a 12 month monitoring period).
4. Samples analyzed for pH, total suspended sediments, nitrate, phosphate, ammonia and total and dissolved nitrogen and phosphorus, (annually and per each storm event).

Objective 2. Seasonally assess local stream flow characteristics to determine the effects of storm flow discharge on the stream environment to predict impacts to habitat restoration goals for the three major fresh water tributaries of the Corsica River.

Measurable Environmental Results

1. Results and analysis reflecting impacts to habitat from temperature, dissolved oxygen, pH, total suspended sediments, nitrate, phosphate, ammonia and total and dissolved nitrogen and phosphorus.
2. Final results within 3 months after last sample collected.

Interim Measures

1. Continuous monitoring results for one week period each season.
2. Includes at least one storm event.

C. Anadromous Fish Spawning and Habitat Goal: The project will conduct sampling in order to evaluate anadromous fish spawning and nursery habitat in the Corsica River. These data will be used to guide stream restoration. Restoration efforts need to consider anadromous and resident fish habitat needs in addition to nutrient reduction in order to realize the full benefit of habitat restoration to address biological impairments.

Objectives

1. Determine if anadromous fish are spawning in the Corsica River and its tributaries.
2. Assess habitat suitability for spawning anadromous fish in the fresh water tributaries.

Measurable Environmental Results

1. Presence of fish during spawning runs.
2. Presence of ichthyoplankton.
3. Presence of young of the year.
4. Habitat conditions.

Interim Measures

1. Samples of early life stages of anadromous fish conducted (and compared to historical data).
2. Conducted ichthyoplankton tows in tidal areas and non-tidal waters.
3. Samples of juveniles in the summer (as part of existing Impervious Surface Project).
4. Delineated spawning and larval habitat (and eventually compared to historical data).
5. Sites evaluated for historical changes in species composition.

PROJECT WORK PLAN

Activities and Deliverables

Nitrate Concentrations in Ground Water

Objective #1: Demonstrate the effect of cover crops on nitrate concentrations in the root zone using soil cores.

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Activities	**Timeline**	**Responsible Entity**	**Deliverables**
Develop Contract for soil core collection and analysis, shallow ground water well installation and sample collection and flow measurement.	Fall 2005	MD DNR MD Cooperative Extension USDA NRCS	Final Contract
Landowner agreements for core sample sites.	Fall 2005	UM WREC MD Cooperative Extension USDA NRCS	Executed agreements
Collect soil cores	Winter 2005	UM WREC	Number of cores collected
Analyze cores	Spring/Summer 2006	UM WREC	Results
Landowner agreements for core sample sites.	Summer/Fall 2006	UM WREC	Executed agreements
Collect soil cores	Winter 2006	UM WREC	Number of cores collected
Analyze cores	Spring/Summer 2007	UM WREC	Results
Landowner agreements for core sample sites.	Summer/Fall 2007	UM WREC	Executed agreements
Collect soil cores	Winter 2007	UM WREC	Number of cores collected
Analyze cores	Spring/Summer 2008	UM WREC	Results

Objective #2: Demonstrate the effect of cover crops on nitrate concentrations in shallow groundwater using shallow wells.

Activities	Timeline	Responsible Entity	Deliverables
Develop Contract for soil core collection and analysis, shallow ground water well installation and sample collection and flow measurement.	Fall 2005	MD DNR	Final Contract
Land owner agreements for well sites.	Fall 2005	UM WREC	Executed agreements
Install wells	Fall/Winter 2005	UM WREC	Number of wells installed
Collect/analyze samples	Winter2005 /Summer 2008	UM WREC	Number of samples and results

Development contribution to the Nonpoint Source Load Goal

Objective #1: Continuously measure flow.

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Activities	Timeline	Responsible Entity	Deliverables
Develop Contract for soil core collection and analysis, shallow ground water well installation and sample collection and flow measurement.	Fall 2005	MD DNR	Final Contract
Secure land owner permission and install gauging sites	Summer/fall, 2005	UM WREC	Sites installed
Collect flow record	Fall 2005 – Summer 2008	UM WREC	Number of samples and results
Annual meeting to present results	2006, 2007, 2008	UM WREC/MD DNR	3 meetings

Objective #2: Characterize chemical and sediment concentrations during base-flow and storm event discharges.

Activities	**Timeline**	**Responsible Entity**	**Deliverables**
Secure land owner permission and install gauging sites	2005	UM WREC	Sites installed
Collect samples during base flow and storm events	2005 –2008	UM WREC	Number of samples and results
Annual meeting to present results	2006, 2007, 2008	UM WREC/MD DNR	3 meetings

Objective #3: Use information to support the development of a new stormwater management ordinance by the Town of Centerville.

Activities	**Timeline**	**Responsible Entity**	**Deliverables**
Provide annual summary of flow and stormwater data	Winter 2006, Winter 2007, Fall 2008	UM WREC	Annual Data Reports
Provide analysis of data in context with current State Storm water design manual	Winter 2006, Winter 2007	UM WREC/MD DNR	2 Fact sheets

Objective #4: Use the flow information to help develop habitat restoration goals for the three major fresh water tributaries of the Corsica River.

Activities	**Timeline**	**Responsible Entity**	**Deliverables**
Provide annual summary of flow and stormwater data	Winter 2006, Winter 2007, Fall 2008	UM WREC	Annual Data Reports
Provide analysis of data in context with fish and invertebrate habitat requirements.	Winter 2006, Winter 2007	UM WREC/MD DNR	Fact sheets

Anadromous Fish Spawning and Habitat Goal

Objective #1: Determine if anadromous fish are spawning in the Corsica River and its tributaries.

Activities	Timeline	Responsible Entity	Deliverables
MOU between Watershed Services Unit and Fisheries for project	2005	MD DNR/WSU	Executed MOU
Ichthyoplankton Survey	2006	MD DNR Fisheries	Presence/Absence of anadromous fish larvae and eggs
Juvenile Fish sampling	2006	MD DNR Fisheries	Presence or absence of juvenile fish and numbers of juvenile fish of the target species.
Annual meeting to present results	2006	MD Fisheries / MD DNR	3 meetings

Objective #2: Assess habitat suitability for spawning anadromous fish in the fresh water tributaries.

Activities	Timeline	Responsible Entity	Deliverables
MOU between Watershed Services Unit and Fisheries for project	2005	MD DNR/WSU	Executed MOU
Estuarine anadromous fish survey	2007	MD DNR Fisheries	Report on habitat conditions
Habitat survey	2007	MD DNR Fisheries	Report on habitat conditions
Annual meeting to present results	2006	MD Fisheries / MD DNR	3 meetings

Cooperating Agencies' Roles and Responsibilities

Agency	Organization	Role/Responsibility
MD Department of Natural Resources/ Watershed Services Unit	Contractor	Manage overall grant
MD Department of Natural Resources/ Watershed Services Unit	Sub-Contractor	Conduct anadromous fish sampling
University of Maryland/Wye Research and Education Center	Sub-Contractor	Conduct soil coring and shallow well sampling

Budget

Nitrate Concentrations in Ground Water

Category	2006	2007	2008	Total
Salaries	$50,000	$50,000	$50,000	$150,000
Fringe (full benefits @ 30%)	$15,000	$15,000	$15,000	$45,000
Sample Analysis (approximately 2000 soil extracts @$4.00; 100 well samples @$20)	$10,000	$10,000	$10,000	$30,000
Well Installation (16 wells @ $500/well)	$8,000			$8,000
Office Supplies	$1,000	$1,000	$1,000	$3,000
Sampling Supplies	$2,500	$2,500	$2,500	$7,500
Travel	$1,500	$1,500	$1,500	$4,500
Equipment (water level data loggers @ $2000)	$8,000	$4,000	$4,000	$16,000
Total	**$96,000**	**$84,000**	**$84,000**	**$264,000**

Contribution of new development to the Nonpoint Source Load

Category	2006	2007	2008	Total
UMD Field sampling staff	$31,000	$31,000	$31,000	$93,000
Fringe (full benefits @ 30%)	$9,300	$9,300	$9,300	$27,900
Office Supplies	$1,000	$1,000	$1,000	$3,000
Sampling Supplies	$3,500	$3,500	$3,500	$10,500
Travel	$1,500	$1,500	$1,500	$4,500
Equipment (water level data loggers @ $2000)	$10,000			$10,000
Total	**$56,300**	**$46,300**	**$46,300**	**$148,900**

Anadromous Fish Spawning and Habitat

Category	2006	2007	2008	Total
Salaries: Fisheries NRBIII (or equivalent) to serve as a coordinator for field volunteers and to conduct field sampling	$33,970	$33,970		$67,940
Fringe (32%)	$10,870	$10,870		$21,740
Sampling Supplies	$1,500	$3,500		$5,000
Travel	$1,500	$1,500		$3,000
Equipment				
drift nets	$900	$4,000		$4,900
YSI meters (2)	$7,000			$7,000
Total	**$55,740**	**$53,840**	**$00.00**	**$109,580**

Summary budget for Year 1

	319(h) funding	State Match	Total
Nitrate Concentrations in Ground Water	$96,000	$64,000	$160,000
Contribution of new development to the Nonpoint Source Load	$56,300	$37,533	$93,833
Anadromous Fish Spawning and Habitat	$55,740	$37,160	$92,900
Total	$208,040	$138,693	**$346,733**

Quarterly spending

Year	1st quarter	2nd quarter	3rd quarter	4sth quarter
2006	**$52,010**	**$52,010**	**$52,010**	**$52,010**

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